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AN AIR-PRESSURE EXTENSION BRUSH FOR APPLYING CREOSOTE TO GIPSY MOTH EGG CLUSTERS

By C. W. COLLINS, *Senior Entomologist*, and J. V. SCHAFFNER, Jr., *Assistant Entomologist, Division of Forest Insects, Bureau of Entomology*[1]

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CURRENT METHODS OF DESTROYING GIPSY MOTH EGGS

The suppression and extermination campaign waged against the gipsy moth (*Porthetria dispar* L.) by States, cities, and towns in the infested areas of New England consists of treating the egg clusters with creosote and spraying foliage of infested plants with lead arsenate to kill the larvae. The eggs are deposited for the most part on the trunks and branches of trees, but also on such other objects as rocks, fences, and buildings, remaining unhatched from July or August to May of the following year. A common practice in the control of this pest is to destroy the eggs by treating the clusters with a creosote mixture darkened with tar or lamp black so that the workmen may readily distinguish between the treated and the untreated clusters. Since the early nineties small pails of creosote and hand brushes have been used in treating the egg clusters deposited low, and brushes mounted diagonally on the ends of bamboo poles 15 to 20 feet in length for the clusters higher up on trees and other objects. (Fig. 1, *b*.) The writers, during the spring of 1929, began to develop an extension brush fed by air pressure.

Those in charge of the treating of the egg clusters have sought to impress upon the workmen the importance of thoroughly soaking each cluster in order to get the best results. Notwithstanding this, the workmen often attempt to treat too many egg clusters with one wetting of the brush, and as a result varying proportions of the eggs in the cluster remain unkilled.

In the spring of 1930 a collection of 23 gipsy moth egg clusters, all of which had apparently been effectively treated with creosote by the

[1] The writers acknowledge the valuable assistance in developing this apparatus rendered by A. E. Lantz of the gipsy-moth laboratory, and their indebtedness to I. T. Guild and C. E. Hood for preparing the drawings and photographs, and to J. E. R. Holbrook, C. M. Symonds, and L. D. Casey for making some of the field tests.

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workmen, were observed for hatching. From one-half of 1 per cent to 59 per cent, an average of 16.6 per cent of all the eggs, yielded larvae that would have fed that season. Further observations made in the same general area during the same spring showed that out of 191 treated egg clusters which were examined, 66 showed some eggs hatching. The apparent reason for this was failure thoroughly to soak each egg cluster.

THE AIR-PRESSURE EXTENSION BRUSH

The air-pressure extension brush was developed with the following purposes: (1) To make it easier to keep the brush always wet when treating the egg clusters, and thus make the work more effective; (2) to make possible the use of a closed container for the creosote, which would be convenient when going through brush land and over obstacles; (3) to save time and add efficiency when using a brush mounted on a long bamboo pole. Lowering the pole to wet the brush and raising it again to the high clusters takes time and causes waste of creosote which drips from the brush.

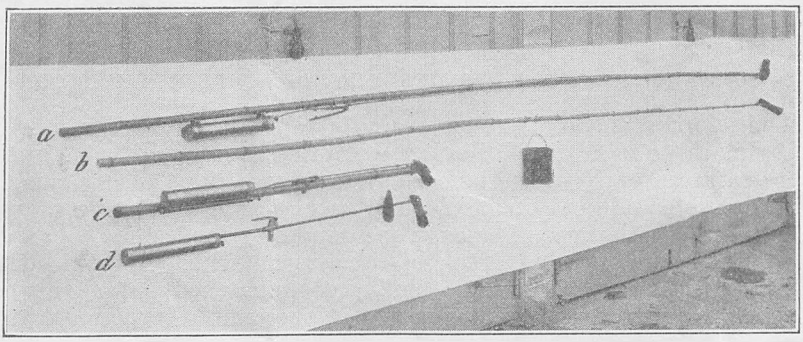

FIGURE 1.—Types of brushes used for treating gipsy moth eggs: *a*, Air-pressure brush adapted to long bamboo pole; *b*, old style long pole with brush and pail; *c*, air-pressure brush on short bamboo pole; *d*, short form of air-pressure brush with iron feed pipe serving as pole

This implement has been compared, in field tests, with the equipment commonly used throughout the area infested by the gipsy moth. These tests seemed to prove that the use of the new brush saves some time, generally saturates the egg clusters more thoroughly, and is cleaner than the old methods. They did not show a saving in the amount of creosote used, but more of the creosote actually was applied to the egg clusters because of the added ease of keeping the brush wet and the elimination of waste due to the creosote dripping from the brush while the pole was being raised.

Since the beginning of this work other possible uses of this implement in addition to the treating of egg clusters of insects have suggested themselves. Gregarious-feeding larvae in the early instars, such as those of the eastern tent caterpillar, or the adult mealybugs (pests of orange trees) might also be reached and treated, and it is hoped that other practical uses may be found. A few local superintendents of moth work in Massachusetts have tried the new brush, and most of these men have commented favorably.

WORKING PRINCIPLE OF THE DEVICE

The outfit consists essentially of a tank, an air pump, a valve to release the liquid used, an extension pole, and a brush. (Figs. 1, *d*, and 2.)

The tank, cylindrical in shape, 12½ inches long and 2 inches in diameter, is made of brass, with a stamped-brass head on one end and a cast-brass head with two threaded holes on the other. It will hold 1 pint of liquid, leaving sufficient space for the compressed air; and will safely withstand a pressure of 50 pounds.

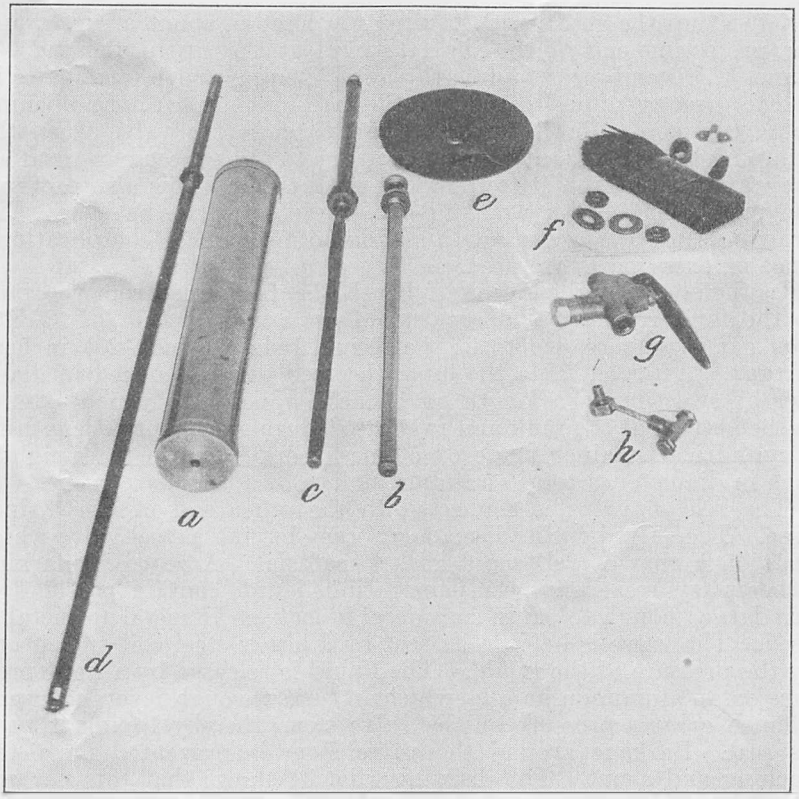

FIGURE 2.—The short form of the air-pressure brush dismantled: *a*, Tank; *b*, air pump; *c*, outlet pipe and strainer; *d*, pipe; *e*, disk to prevent creosote from running down the pipe; *f*, brush and fittings; *g*, release valve; *h*, screw cap and T

Air pressure is obtained by means of a small pump, 11½ inches long and one-half inch in diameter, which screws into one of the threaded holes in the head of the tank. (Fig. 3.)

The reasons for mounting the pump in this manner are (1) to reduce the number of joints through which air or liquid might leak, the pump-shaft guide being threaded (⅝-inch–18) and fitted with a flange and gasket so that the pump assembly acts as a filler cap and its removal permits filling through this opening; (2) to protect the pump from damage, such as dents in the pump cylinder which would

render it useless; and (3) to give the outfit a trim appearance and make the tank, which acts as a grip for one hand, less bulky.

The valve mechanism (fig. 3) in this pump differs from the usual kind in comprising two valves instead of one. The first is of the ordinary check-valve type, consisting of a steel ball which is held on its seat by a light steel coil spring and also by the back pressure of the liquid. (Note: In using liquids inclined to cause rust, it would be advisable to use a brass ball and spring instead of steel.) As a second precaution against the loss of liquid or air pressure, a second valve of the needle type is used. To make this valve the pump piston, instead of being fastened to the extremity of the pump shaft, is moved up the shaft, i. e., toward the handle, about an inch, and the projecting end of the shaft tapered at the tip in about a 45° angle. This end screws into a threaded opening which terminates in a seat directly opposite that of the ball-check valve, the opening being common to both valves. Thus, to close the valve when the pumping is completed it is only necessary to push the pump shaft all the way in and screw it to the right until tight. This also prevents the pump shaft from working out where it might be bent. The drawing (fig. 3) shows that this adds no mechanical complications, since no extra parts are used.

In the short-handled type of brush the feed line from the tank to the fluid release valve consists of an 8-inch section of ¼-inch iron gas pipe, threaded to fit the second hole (½-inch–20) in head of tank. After entering the tank, the feed line is reduced in diameter by sweating in a length of $\frac{3}{16}$-inch copper tube which extends to the bottom of the tank and is encased through its entire length by a cylindrical strainer made of 50-mesh copper gauze three-eighths inch in diameter, a total straining surface of 10.6 square inches.

The release valve is connected to the other end of the ¼-inch pipe. The valve housing is made of brass, having a steel valve which seats on a ring of vellumoid gasket material. A seat of this kind is necessary because certain penetrating liquids contain particles of grit large enough to cause considerable leakage if metal to metal is used. The valve is held on its seat by a heavy steel coil spring and by the pressure of the liquid. The liquid is released by a light pressure on an aluminum handle, which in turn, through leverage, exerts a much greater pressure on the valve stem, thereby lifting it from its seat. Leakage around the valve stem is prevented by a felt packing and a nut. The drawing (fig. 3) shows that this packing is on the low-pressure side of the valve, since the liquid is free to flow through the small holes in the T which will be described in the following paragraph.

From the valve the liquid passes through a ⅛-inch gas pipe 26½ inches long, on the other end of which is a brush. The brush is 1¾ inches wide, ⅝ inch thick, and 5 inches long. It is held rigidly to the pipe at an angle of 45° by drilling a hole at that angle through the wooden portion of the brush, slipping it on over the pipe, and clamping it by means of a nut to two beveled sleeves, one of which rests against a cap screw in the extreme end of the pipe. This cap screw is drilled to form a passage for the liquid and has soldered to it a 1⅝-inch section of ⅛-inch copper tubing and a

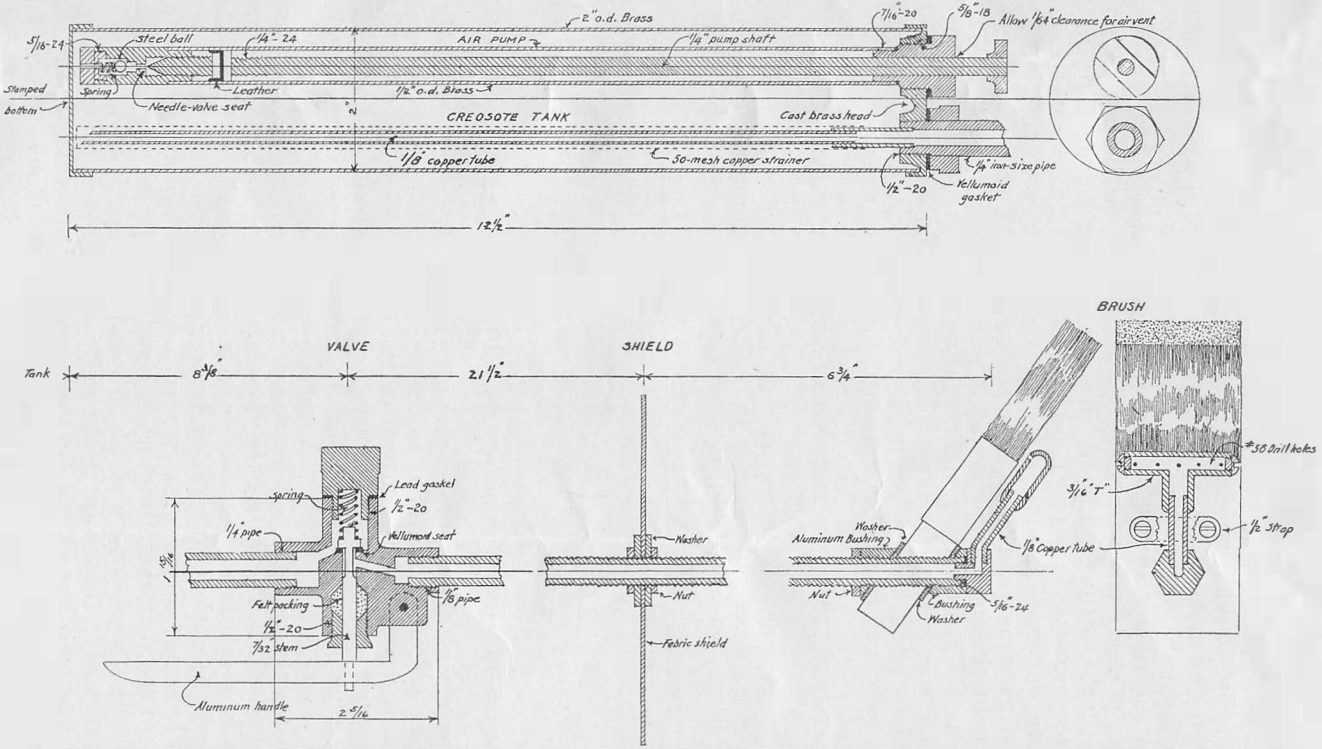

FIGURE 3.—Details of the tank, valve, shield, and brush of the short form of the air-pressure extension brush

brass T having six small holes through which the liquid is distributed among the bristles at their bases.

A fiber disk is fitted around the pipe near the brush to prevent the surplus liquid from running down the pipe. It is held in place between two nuts on the pipe, which is threaded a short distance down from the upper end.

The entire apparatus, 4 feet in length, weighing 3 pounds 9 ounces, is easily taken apart for cleaning. If the liquids used will congeal, the outfit should be cleaned or some solvent left in the tank to prevent gumming the air-pump valves. For instance, after creosote was used (as it was in the experiments with this brush), a pint of gasoline or kerosene was put in the tank, and, under several pounds of pressure, a portion of it was allowed to pass through the valve and T in the usual manner, thus flushing the system; the remainder was left in the tank. If, however, the outfit is to be left unused for some time it is advisable to disconnect, clean, and dry it thoroughly, and to oil the parts made of steel.

ADAPTATIONS TO EXTENSIONS GREATER THAN 4 FEET

Where it is desired to use poles from 10 to 18 feet in length, some changes are necessary in order to obtain both rigidity and lightness. A bamboo pole is used, and the tank is fastened 6 or 8 inches from its

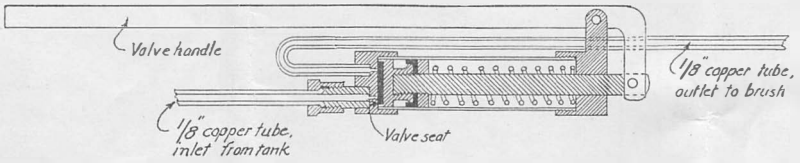

FIGURE 4.—Release valve for use with the bamboo pole and copper tube supply line

base by means of two brass straps. (Fig. 1, *a*.) The strainer and feed-line assembly is similar to the one described except that it has a 1/8-inch copper tubing instead of the 1/4-inch iron pipe. This 1/8-inch copper tubing runs the entire length of the pole and terminates in the regular T. It is fastened to the pole by small metal straps placed at 2-foot intervals. A release valve (fig. 4) especially designed for this type of pole is placed in this feed line about 8 inches from the tank. The valve, the housing of which is cylindrical, is 3 inches long and five-eighths of an inch in diameter. Both the intake line and the outlet from this valve connect at the same end of the valve housing. The valve proper is similar to a common air-pump piston, but extending beyond and fastened to this piston is a flat, leather-faced surface which will cover the openings of both lines simultaneously. The valve is closed by a strong steel coil spring and is released by a handle, the leverage principle of which is the same as that on the 4-foot outfit. The pump-piston device acts as a packing and prevents the liquid from escaping around the valve stem. The valve assembly is also fastened to the pole by means of metal straps.

The brush is clamped to the pole by a metal frame and four bolts and nuts. To prevent the liquid from running down the pole a felt

pad is strapped around the brush just back of the T. This is used instead of the fiber disk mentioned in connection with the 4-foot pole, because there is no way of making a tight joint around both pole and feed line.

COST OF THE AIR-PRESSURE EXTENSION BRUSH

Two manufacturers were asked for estimates on the probable cost of the implement. The low estimate on brushes of the short-pole type was $11.60 each, provided there was sufficient demand to warrant manufacturing them in lots of 50 or more. The long-pole type would cost slightly more, owing to the cost of the bamboo pole and the copper tubing from the valve to the brush.

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